

**MICHIGAN ENVIRONMENTAL SCIENCE BOARD  
LEAD PANEL**

**MEETING SUMMARY  
MONDAY, APRIL 25, 1994  
PLANT AND SOIL SCIENCE BUILDING, ROOM A-271  
MICHIGAN STATE UNIVERSITY  
EAST LANSING, MICHIGAN**

**PANEL MEMBERS PRESENT:**

Dr. Jonathan Bulkley, Chair  
Dr. David Long  
Dr. George Wolff  
Dr. Raymond Demers

**PANEL MEMBERS ABSENT:**

None

**BOARD STAFF PRESENT:**

Mr. Keith Harrison, MESB Executive Director  
Mr. Jesse Harrold, Environmental Officer  
Ms. Shirley Willis, Administration Officer  
Mr. Alex Morese, Student Intern

**I CALL TO ORDER**

Dr. Jonathan Bulkley, Chair, called the meeting of the Michigan Environmental Science Board (MESB) Lead Panel to order at 1:30 p.m.

**II EXECUTIVE DIRECTOR'S REPORT**

Mr. Keith Harrison, MESB Executive Director, announced that in addition to the 2 scheduled speakers, Ms. Celeste Bennett, Michigan Department of Agriculture (MDA), would make a presentation to the Panel regarding lead in gasoline. He noted that the meeting summary of the last meeting was not yet available because of the short time between meetings. Mr. Harrison then summarized a recent National Public Radio report on lead. An NPR panelist, Dr. Michael Wilkes, concluded that the recent incidence of lead in crayons was an overreaction and did not constitute a health threat. A second panelist, Dr. Marian Schuchman cited dangers of lead in the past and thought every precaution should be taken to protect children. A transcript of the program is being obtained and will be sent to the Panel upon receipt. Mr. Harrison went on to describe the contents of the package of literature the Panel had been given.

Dr. Bulkley asked Mr. Harrison to obtain a Center for Disease Control (CDC) report on a strategic plan for eliminating child lead poisoning. He also alerted the Panel to a concern about lead paint in schools. Dr. Bulkely indicated that he will follow up on this issue.

### **III PRESENTATIONS**

**Dr. Jerome Nriagu**, University of Michigan, discussed historical and current data on lead contamination in the U.S. A summary of his presentation may be found in Attachment 1.

Dr. Bulkley asked whether the focus should remain on children, or if the adult population is also at risk. Dr. Nriagu answered that the children may be at the greatest risk, but it is likely that everyone would be exposed to highly elevated levels of lead in food and water. Children may also be more at risk through mothers' milk, which contains relatively high lead concentrations, even where exposure is controlled. A source of exposure for everyone is the lead that is stored in bone and released in increasing doses during the aging process. This process can actually make the bones more brittle.

Dr. Demers said that he has reviewed several studies done in the 1970s where samples were taken from venous blood and showed much higher blood lead levels than they do currently. He asked Dr. Nriagu how confident he was that the blood lead levels recorded in the 1970s were really too high. Dr. Nriagu answered that he bases his conclusion on the work that was done trying to measure lead in environmental samples. As measures to avoid contamination improved, lead levels decreased. The use of stainless steel needles in venous sampling is currently causing contamination. The Michigan Department of Public Health (MDPH) has 2 labs that analyze blood lead levels, but he does not think their control for sampling contamination is adequate and would not use them himself.

Jesse Harrold, MESB staff, asked whether Dr. Nriagu's theory that blood lead levels were much lower 10,000 years to 15,000 years ago had been supported with actual comparative studies. Dr. Nriagu answered that there have been such studies and that there were significant differences found.

**Dr. Joel Pounds**, Wayne State University, discussed cellular and molecular effects of lead. A summary of his presentation may be found in Attachment 2.

Concerning the Australian study of lactating mothers, Dr. Wolff asked why the isotope ratio was different in the two hemispheres. Dr. Pounds indicated that it was because of the different ore deposits of lead in the two hemispheres.

Dr. Demers asked what percentage of inhaled lead is absorbed through the respiratory tract. Dr. Pounds answered that it was around 50% in adults, but was much higher in children.

Dr. Long asked if there was any study on people who worked in lead mines. Dr. Pounds replied that there have been some occupational studies done on workers in lead smelting facilities, but he was uncertain about lead mines.

Dr. Bulkley asked about the safety factor in lead exposure regulations and who should be responsible for them. Dr. Pounds stated that he believed the federal government currently does not, but probably should, bring lead into the same risk benefit safety factor perspective as PCB's, dioxin and pesticides. Dr. Wolff commented that the Clean Air Act, for instance, requires a standard to be set at a level below which an effect would be expected. To this is added an adequate margin of safety to cover the populations which have not been studied. Each time that a review of the standard is conducted, new data appear to show an effect at an even lower level. It is beginning to appear that risk cannot be eliminated. Instead, an acceptable risk will need to be chosen. The same thing appears to be happening with lead.

Mr. Harrison asked if other contaminants or metals were tested for during the lead I.Q. studies. Dr. Pounds answered that the only other data collected pertained to the children's mothers' use of cigarettes and alcohol. Other factors should have been included, but that has not been the nature of toxicology studies in the past. Despite this, and because of the great agreement between animal and human studies, in terms of the blood lead levels needed to produce the same constellation of pathologies in the kidney, brain and other organ system, he did not feel that the lead studies were affected to any great degree because of undue influence of other contaminants.

**Ms. Celeste Bennett**, MDA, provided a presentation on lead in gasoline. A copy of her presentation is attached (Attachment 3).

Dr. Demers inquired about the method used for sampling. Ms. Bennett stated that MDA employs 2 different sampling methods. One is routine random, where MDA selects so many samples a month. Each retail outlet in the state has a probability of being selected. Random sampling was instituted in 1993/94. MDA anticipates conducting over 2,000 samples in 1994/95. The other is complaint sampling in which MDA will take a sample of the questionable fuel. Mr. Harrison asked if complaints from farms are processed in the same manner as other complaints. Ms. Bennett indicated that most complaints from farmers are in regards to receiving something other than what they purchased. Complaints of this nature would entail sampling either from bulk or the delivering tanker. Dr. Demers asked if the samples shown in Ms. Bennett's handout are random samples or complaints. Ms. Bennett replied that samples shown prior to 1992 are a combination of complaint and compliance samples. Random sampling was not instituted until 1993.

Dr. Wolff asked what percent of samples that are assumed to be unleaded turns out to be leaded fuel. Ms. Bennett stated that from 1990 to 1992, MDA's monitoring technique was to check every sample to make sure that it did not exceed the standards for lead. During that period of time, there were a lot of problems in lead standard violation and

contaminated fuel. By 1993, there were no violations of the samples, so the number of samples being checked was reduced. Ms. Bennett spoke about some of the violations they have encountered such as illegal fuel extenders added to gasoline ("*cocktailing*"), and "*interfacing*" - commingling of products in the pipeline and then transferred into the gasoline. These problems generally have resulted in gasoline exceeding the lead standard. Because of the recent price jump in gasoline, MDA expects to see more cocktailing in the marketplace.

Dr. Bulkley asked how many service stations are in the state. Ms. Bennett responded that there are approximately 5,600 licensed retail outlets; however, only a small percentage of gasoline that is sold is sampled. She indicated that, generally, independent companies are checked rather than major oil companies, because major oil companies usually have their own programs in place to check the quality of the gasoline. There are 4 statewide investigators to cover the entire state.

Based on the number of complaints that MDA receives, most gasoline contamination seems to be occurring in the southeastern part of the state and in isolated pockets throughout the remainder of the state. Over one third of the gas stations are located in southeastern Michigan. Competition is very fierce in this part of the state.

Dr. Bulkley asked about lead in aviation fuels. Ms. Bennett indicated that the MDA does not have any standards for aviation fuel. The American Society for Testing Materials has established that standard.

Dr. Wolff asked what percentage of the licensed gas stations are owned by independents. Ms. Bennett indicated that approximately 60%.

#### **IV PANEL MEMBER ASSIGNMENTS**

Dr. Bulkley indicated that the Panel was still in the data gathering stage at this time. Panel member assignments would be addressed at the next meeting.

#### **V PUBLIC COMMENTS AND QUESTIONS**

Dr. Fred L. Brown commented that some sort of compilation of a time line for persistent toxic substances and the most critical dose response points along that time line would help address and regulate the problem in the environment. Dr. Brown asked Dr. Bulkley if the Board could address this issue. Dr. Bulkley stated that the Lead Panel has been charged specifically with addressing the lead issue. Mr. Harrison indicated that there is definitely an interest in that issue; however, pursuant to Executive Order 1992-19, the MESB can only address those issues specifically requested by Governor. However, suggestions for concerns to be addressed by the MESB may be sent to the Governor's office, specifically to Chad McIntosh, the Governor's Environmental Advisor.

## **VI      NEXT MEETING DATE**

The next meeting of the MESB Lead Panel will take place on Monday, May 2, 1994 at 1:00 p.m. at Holden Hall (Room C-231), Stadium Road on the campus of Michigan State University, East Lansing, Michigan.

## **VI      ADJOURNMENT**

The meeting was adjourned at 4:20 p.m.

Keith G. Harrison, M.A., R.S., Cert. Ecol.  
Executive Director  
Michigan Environmental Science Board

## **Attachment 1. Summary of Dr. Jerome Nriagu, University of Michigan, Presentation to the MESB Lead Panel.**

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Dr. Jerome Nriagu, University of Michigan, began his presentation by pointing out that while measured lead concentrations in Lake Erie, for instance, have declined from about 5,000 mg/l to 28 mg/l, there has been no actual historical change in lead concentration. The decline is the result of improved measurement techniques. There has been a similar decline in blood levels since 1974. However, those declines may have more to do with methodological contamination in the screening process than with actual declines in blood levels. In fact, actual levels were much lower than they seemed during the 1970s. That means that lead poisoning effects were manifested at much lower blood levels than had been thought, calling into question the current notion that there is no need to worry about the effects of currently lower measured lead levels in blood.

Lead exposure remains a problem for many children, according to a CDC report to Congress in March. That report defined the number of children at risk from various primary or major sources. It estimated that 8 million children are at risk for being exposed to the 37 tons of lead still in the soils from gasoline; 9 million at risk from exposure to soil and dust; 6 million from exposure to leaded paint in buildings and homes; and 4 million from plumbing. Saying simply that blood levels have declined masks the very real risk that still exists.

There are other, less common, but equally dangerous exposure routes. Lead glazing used in pottery is still a problem. Some printing ink still contains lead, as do some cosmetics, hair dyes and unlicensed medical products. Lead in wine from vineyard soils that were sprayed with lead arsenic as an insecticide is still common. Some farms may have very high levels of lead in the soil. Things like smoking, gunshot wounds, additives to snuff in some countries, and even moonshine distilled in old car radiators are other examples of individual exposure routes.

Dr. Nriagu discussed the status of current lead emissions. The U.S. Environmental Protection Agency (USEPA) estimates that total emissions in the U.S. have declined from about 52,000 tons to almost 5,000 tons. The decline is occurring in emissions being released into the atmosphere from leaded gasoline, industrial processes, and solid waste disposal. He questions the data, however, based on the way it is collected. USEPA surveys industry for the data, and industry is inclined to underestimate. His own estimate is that total current emissions are more like 15,000 tons to 25,000 tons, rather than 5,000 ton. In any case, in terms of exposure, all the lead that has been released, which he estimates to be 6 million tons to 8 million tons in the U.S., is still somewhere with 50% to 60% having been deposited where the emissions occurred. His estimates of historical emissions are based on data from various mineral yearbooks that give the amount of lead used for gasoline from 1930 to 1990.

Most of the lead that has been released from gasoline and other sources is still being recycled through the biosphere, even though levels in the atmosphere have declined. Some of the lead being recycled will show up in the human bloodstream. Although many people say that blood lead concentrations will quickly reflect declines in airborne concentrations, Dr. Nriagu does not think that the relationship between lead in the air and lead in the blood is that clear cut, and because breathing ambient particulate lead is not necessarily a significant pathway, a direct relationship may not make theoretical sense. The long term observed relationship suggests that the flow of lead, from environmentally measured lead to humans, follows a term of 1 to 3 years. However, the data indicating long term declines in both measurements also show that peaks in blood levels follow, rather than coincide with, peaks in air measurements. He thinks that the intervening variable between lead in the air and lead in the blood is actually contamination of the food supply, particularly vegetable products. It is the only pathway that can explain both child and adult levels, since adults are not likely to ingest lead directly through dust and soil by hand to mouth contact, and the only pathway that explains the delay between high atmospheric measurements and the presence of lead in the human bloodstream. The effects of the lower levels of blood lead are not yet known.

Historically, Dr. Nriagu estimates that a person living 10,000 years to 15,000 years ago would have ingested approximately .16 ug of lead per day. That would translate to a blood lead level of .02 ug/dl. Today, the average level in the U.S., according to the CDC, is 5 ug/dl, about 300 times higher. The value is for venous blood, which is more accurate than the thumbprint method used for earlier research. So while there has been much done to reduce ambient levels, blood lead levels are still higher than they have been historically.

## **Attachment 2. Summary of Dr. Joel Pounds, Wayne State University Presentation to the MESB Lead Panel.**

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Dr. Pounds indicated that lead toxicity is a complex, multifaceted disease. Mankind's use of lead over the centuries, especially since the industrial revolution, has increased human exposure to approximately 1000 to 5000 times higher than natural occurring levels. This conclusion is based on evidence from lead analysis of tree rings, polar ice caps, and human bones. Efforts to control reduce global lead exposure, such as the removal of lead in gasoline, has resulted in decreased blood lead levels.

Lead toxicity is not a specific disease, nor does it cause a specific functional or biochemical dysfunction which can be easily diagnosed. Lead poisoning is cumulative, insidious, and not specific in manifestation, and multifactorial in formation. Diet, age, duration of exposure, and genetic differences are among the important modulating factors. Diagnosis and recognition of this chemically-induced disease is complicated by variability of response from individual to individual. These characteristics impair diagnosis at the medical level and impair recognition and appreciation of the problem by society at large.

Although the principal health concern is the central nervous system in young children. Children have been the most carefully investigated population, however, it is apparent that lead poisoning affects other populations. All individuals are exposed to lead through their environment, food, and water. Occupation exposure is a continuing problem as are accidental or sporadic exposures to lead which may occur from ceramic and leaded crystal glassware, cosmetic, hobbies, etc.

**Lead Exposure:** Lead is a rare element in the earth's crust. The lead in our environment(s) is the result of mans use of lead for industrial purposes of the last few hundred years, especially since the industrial revolution. Thus, it is important to recognize that "normal" intake and tissue levels of lead are about 1000 to 5000 times higher than the lead levels the human body has evolved to deal with. The blood lead level for medical intervention has been reduced from 60  $\mu\text{g/dl}$  in the 1960s to the current action level of 10  $\mu\text{g/dl}$ . The lowering of this action level has been driven by the results of human studies. In the late 1970s, the National Health and Nutrition Examination Survey (NHANES), a demographic survey of the USA, put the median blood lead level in children 0.5 to 6 years of age a 14.7  $\mu\text{g/dl}$ . A comparable demographic survey is not available for the 1990s, but the USEPA estimates "normal" blood lead level at 4.3  $\mu\text{g/dl}$  for rural children.

**Nervous system effects:** The effects on the central nervous system are generally considered the most important health effect of lead. Although the fetus and young children are most vulnerable, adults also show broad spectrum of nervous system dysfunctions. These effects range from the loss of IQ and attention span in children to headaches, irritability, and loss of fine motor function, encephalopathy and even

death at higher levels of lead. Unfortunately, there is no specific neurological test for lead poisoning in either children or adults.

The most well known data are from a series of studies conducted by Herbert Needleman of the University of Pittsburgh. These investigators related the level of lead in baby teeth to school performance, IQ scores, motor skills, etc. When the results were controlled for 39 other factors, including socioeconomic status, family size, and mother's IQ, etc. elementary school children in the high-tooth-lead group had a median IQ deficit of six points, shorter attention spans, and impaired language skills compared to their low-lead class mates. A recent examination of these same children, eleven years after the first study, was conducted to determine whether the effects of early lead exposure persisted into young adulthood. Compared to their lower-lead classmates, the higher lead group showed a 7.4-fold increase in school dropout rates, and a 5.8 fold increase in reading disabilities. The higher-lead group also exhibited lower class rank, and higher absenteeism. Thus, lead causes impairments in reading, writing, mathematics, abstract thinking -- all the skills necessary for academic success.

**Cardiovascular Disease:** Human studies have consistently shown a negative correlation between exposure to lead and systolic and diastolic blood pressure in adult males. Although the increase in blood pressure due to lead is relatively small, the concern is significant from a public health perspective due to the incidence of cardiovascular disease in America.

**Reproductive Toxicity:** Epidemiological experimental studies show failure of ovulation, delay sexual maturity, sterility, and spontaneous abortions. Furthermore, there are numerous reports and data for human adults evaluated with spontaneous abortion, structurally abnormal sperm and decreased fertility.

**Growth:** Cross-sectional and prospective epidemiological studies in humans have demonstrated an inverse correlation between blood-lead levels, stature and thoracic circumference. Each 10  $\mu\text{g}$  increase in Pb / 100 ml of whole blood is associated with a 1 cm decrement in height. Although the health consequences of reduced stature is problematic, reduced stature undoubtedly reflects underlying hormonal and endocrine dysfunction which may be manifested in more important ways than stature.

**Cancer:** The U.S. Environmental Protection Agency has recently classified lead as a "probable human carcinogen" based on data from animal and human studies. This assessment is not uniformly accepted among lead researchers, and most would agree that lead malignant disease is not an important health effect of lead exposure.

**Current scientific issues in lead toxicity** which impact upon the Lead Panel's mission include,

- Persistence vs reversibility of effects on the nervous system and other organs. This clarification is important to direct the most appropriate and cost effective remediation strategies.

- \_ The importance of skeletal lead as a dosimeter for cumulative lead exposure, and the skeleton as a reservoir of lead, as a target organ is indisputable. Approximately 90% of an adult's body burden of lead resides in the skeleton, with a half life of 10-20 years. The use of skeletal lead as a dosimeter is likely to reduce the threshold for effects by providing more sensitivity lead evaluation than blood lead measurements. The potential contribution of lead to osteoporosis and other diseases is likely to identify a new populations-at-risk. In addition, there is concern that skeletal lead stores may be released during pregnancy, lactation, stress, and aging. The health significance of this release is under study in several laboratories.

**Conclusions:** Lead toxicity is a complex and multifaceted disease, which is relatively unrecognized and undiagnosed. The symptoms of lead toxicity are non-specific, multifactorial, and occur at ambient levels of lead exposure. The economic and social burden of this problem is enormous.